in formula 57 below. The sum is then added to the input vector S to form $S_{updated}$ (step **310**) as shown in formula 58 below.

$t_{100}=w_1+w_3$ formula #57

$w_1+w_3=[0\ 1\ 0\ 1\ 0]$ formula #58

$S_{updated}=\{w_0,w_1,w_2,w_3,w_4,t_{100}\}$ formula #59

[0044] As shown in formulas 42-47, formulas w_1, w_3 and w_4 all include the term w_1+w_3, which can now be replaced by t_{100} reducing the number of additions required to determine w_1, w_3 and w_4 by one, and thus also reducing corresponding distance vector D to form an updated distance vector D updated (step **312**) as shown in formula 60 below:

$D_{updated}=[2\ 1\ 3\ 1\ 1\ 2]$ formula #60

[0045] Steps **308-312** may then be repeated until the distance vector D is minimized, if possible to include all zeros, as shown by formulas 61-87 below.

$t_{101}=w_0+t_{100}$ formula #61

$w_0+t_{100}=[1\ 1\ 0\ 1\ 0]$ formula #62

$[1\ 1\ 0\ 1\ 0]=z_4$ formula #63

$D_{updated}=[2\ 1\ 3\ 1\ 0\ 2]$ formula #64

[0046] At this point we have found signal z_4, so the sums of formulas 57 and 61 are saved in a straight line program.

$t_{102}=w_2+t_{100}$ formula #65

$w_2+t_{100}=[0\ 1\ 1\ 1\ 0]$ formula #66

$[0\ 1\ 1\ 1\ 0]=z_3$ formula #67

$D_{updated}=[2\ 1\ 3\ 0\ 0\ 1]$ formula #68

[0047] At this point we have found z_3, so formula 65 is added to the straight line program.

$t_{103}=w_4+t_{100}$ formula #69

$w_4+t_{100}=[0\ 1\ 0\ 1\ 1]$ formula #70

$[0\ 1\ 0\ 1\ 1]=z_1$ formula #71

$D_{updated}=[2\ 0\ 3\ 0\ 0\ 1]$ formula #72

[0048] At this point we have found z_1, so formula 69 is added to the straight line program.

$t_{104}=w_2+t_{103}$ formula #73

$w_2+t_{103}=[0\ 1\ 1\ 1\ 1]$ formula #74

$[0\ 1\ 1\ 1\ 1]=z_5$ formula #75

$D_{updated}=[2\ 0\ 2\ 0\ 0\ 0]$ formula #76

[0049] At this point we have found z_5, so formula 73 is added to the straight line program.

$t_{105}=w_0+w_1$ formula #77

$w_0+w_1=[1\ 1\ 0\ 0\ 0]$ formula #78

$D_{updated}=[1\ 0\ 1\ 0\ 0\ 0]$ formula #79

$t_{106}=w_2+t_{105}$ formula #80

$w_2+t_{105}=1\ 1\ 0\ 0\ 1$ formula #81

$[1\ 1\ 1\ 0\ 0]=z_0$ formula #82

$D_{updated}=[0\ 0\ 1\ 0\ 0\ 0]$ formula #83

[0050] At this point we have found z_0, so formulas 77 and 80 are added to the straight line program.

$t_{107}=t_{103}+t_{106}$ formula #84

$t_{103}+t_{106}=[1\ 0\ 1\ 1\ 1]$ formula #85

$[1\ 0\ 1\ 1\ 1]=z_2$ formula #86

$D_{updated}=[0\ 0\ 0\ 0\ 0\ 0]$ formula #87

[0051] At this point we have found z_2, so formula 84 is added to the straight line program. Also, since the distance vector $D_{updated}$ now includes only zeros we are finished. Notice that this last operation added [01111] and [11000], to obtain [10111], so there was a cancellation in the second entry, adding two ones to get a zero. This possibility makes this technique different from prior techniques. For example, under the PAAR algorithm, no cancellation of elements is allowed.

[0052] Combined together, here is the straight line program for computing z_0-z_5, which only requires 8 XOR operations, instead of the 14 XOR operations required if z_0-z_5 are calculated separately.

$t_{100}=w_1+w_3$ formula #57

$t_{101}=w_0+t_{100}$ formula #61

$t_{102}=w_2+t_{100}$ formula #65

$t_{103}=w_4+t_{100}$ formula #69

$t_{104}=w_2+t_{103}$ formula #73

$t_{105}=w_0+w_1$ formula #77

$t_{106}=w_2+t_{105}$ formula #80

$t_{107}=t_{103}+t_{106}$ formula #84

[0053] In one example, if during step **308** there is a tie between multiple pairs of basis vectors (i.e. the sum of two sets of basis vectors achieves a reduction in D of the same magnitude), then the tie may be resolved by using one of a plurality of tie-breaking techniques that utilize a Euclidean norm of the updated distance vector. The Euclidean norm is calculated by calculating a square root of a sum of squares of elements of the updated distance vector.

[0054] In a first tie-breaking technique, a pair of basis vectors is selected whose sum induces the largest Euclidean norm in the new distance vector. For example, if a sum of a first pair of basis vectors resulted in a distance vector of [0 0 3 1] (which has a Euclidean norm of $\sqrt{0^2+0^2+3^2+1^2}=3.16$) and a sum of a second pair of basis vectors resulted in a distance vector of [1 1 1 1] (which has a Euclidean norm of $\sqrt{1^2+1^2+1^2+1^2}=2.00$) the first pair would be chosen because it induces a higher Euclidean norm. Of course, the step of actually calculating the square root could be omitted, as 3.16^2 would still be greater than 2.00^2.

[0055] In a second tie-breaking technique, a pair of basis vectors is selected who has the greatest value of a square of the Euclidean norm minus the largest element in the distance vectors.